REMARKS

Upon entry of the present amendment, claims 6, 10, 14 and 16-22 are pending in the application, of which claims 6, and 17 are independent.

Claims 6 and 17 have each been amended to more particularly define and claim that each of the first and second shot peening treatments last for a duration in a range of 5 to 10 seconds, that the roughness of the cavity surface is not more than 16μm, and the compressive residual stress is 1000MPa or larger after the first shot peening treatment and before the sulphonitriding treatment.

Applicant respectfully submits that the added claim limitation is fully supported by the original disclosure, including paragraphs [0047] and [0052] defining an exemplary embodiment of the invention. Applicant also respectfully submits that no new matter is introduced by the present amendment.

The above-identified Office Action has been reviewed, the references carefully considered, and the Examiner's comments carefully weighed. In view thereof, the present Amendment-F is respectfully submitted.

It is respectfully contended that by the present amendment, all bases of rejection set forth in the Office Action have been traversed and overcome. Accordingly, reconsideration and withdrawal of the rejection is respectfully requested.

The Present Invention

The present invention relates to a casting die and a surface treatment for the die. With the casting die of the present invention it is possible to decrease the frequency of replacement of the die, the longer service life of the die making it possible to reduce the production costs of the cast products. The sulphonitriding diffusion layer can be easily formed on the cavity surface by the sulphonitriding treatment that is conducted after a first shot peening treatment.

Claim Rejections – 35 USC § 103

In Item 3 of the Office Action, the Examiner rejected claims 1-3, 6, 10, 17-19 and 21-22 under 35 USC 103(a) as unpatentable over JP 2002-060845 (JP '845) and further in view of JP 10-204,610 (JP '610). The rejection states that JP '845 discloses a method for prolonging the service life of a casting die by maintaining the compressive residual stress of a die cavity surface for more than 1000MPa and through a shot peening and nitriding process, except that JP '845 does not disclose the surface roughness (maximum height) that is not more than 8μm and the use of a nitrosulphurizing process for coating the die surface. However, its is the Examiner's position that JP '610 discloses the use of a nitrosulphurizing process to form a coating layer on the die surface to prevent seizure in a die by forming a dense coating layer having a lubricating effect and a thermal insulating effect which improves service life by forming a nitride layer containing iron sulfide on the die cavity surface. The Examiner has taken the position that it would have been obvious to further include the iron sulfide of JP '610 with the nitride layer of JP '845.

With respect to the roughness (maximum height) of the cavity die surface, the rejection states that due to the alleged similarities between the shot peening treatment of JP '845 and that of applicant's invention, it is expected that the surface roughness of JP '845 will be the same as that of the instant application.

Applicant's Response:

Upon careful consideration applicant traverses the Examiner's rejections of the present claims, and submits that each of the present claims is patentably distinct over the applied references whether considered singly or in combination, based on the following.

With respect to claims 6 and 17, Applicant respectfully submits that the proposed modification of JP '845 to include a select feature of JP '610 (a sulphonitriding treatment) is

improper, because such modification is based entirely on a suggestion coming entirely from the Examiner (guided by impermissible hindsight of the applicant's disclosure), rather than on the teaching of the references themselves, or from any other evidence of record.

In this regard, applicant again notes that persons skilled in the art understand that a forging die requires thermal insulating properties, whereas a casting die does not. As such, persons of ordinary skill in the art would not consider it obvious to apply the sulphonitriding treatment of the JP' 610 forging die to the casting die of JP '845 as proposed by the Examiner, because the references provide no motivation for doing so and may make the reference unsatisfactory for its intended purpose. If the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. ***In re Gordon***, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

Applicant respectfully traverses the Examiner's assertion that the claimed surface roughness is an *obvious matter of optimization through routine experimentation.* This allegation is unfounded because *none of the applied references ever indicates that surface roughness is a result-oriented variable, which should be optimized.*

MPEP 2144.05(B) states that "A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation". *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977).

It is respectfully submitted that the art in this instance does not recognize the surface roughness as a result-effective variable. See also *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

In contrast to the teaching of JP '845, the claimed invention's surface roughness (maximum height) is made not more than a predetermined value, i.e. not more than 16 μm after the first peening step, and not more than 8 μm after the second peening step. In addition, in the embodiment of the invention as claimed in amended claims 6, 10, 14, 16 and 21, by setting the shot peening time for a period in a range of 5 to 10 seconds in each of the first and second shot peeing treatments, the present invention specifies a maximum time period significantly less than the time period taught by JP '845. This is significantly different from the teaching of the reference, and applicant respectfully submits that applying the shot-peening treatment for such a reduced duration is non-obvious as compared to such teaching. It is unexpected that using a time period considered insufficient by the prior art would provide a useful result. Applicant respectfully submits that it is well known that the surface roughness Ry (maximum height), after a shot peening treatment, varies as the projection conditions varies, as when the treatment time is extended from 5-10 seconds (as in amended claim 6) to 60 seconds. In some case, the surface roughness Ry (maximum height) can exceed 8 μm. Please see, for example, FIG. 3 of JP 2001-9725A (a copy thereof was enclosed in applicant's previous amendment). Consequently, JP '610 does not overcome the above-noted defect of JP ' 845.

JP 845 shows a residual stress of less than 1000 MPa even after the two shot peening treatments. This is contrary to claims 6 and 17 which specifically set forth the residual stress is 1000 MPa or larger after the second peening step.

In regard to claim 10, applicant respectfully traverses the rejection. JP '845 discloses a method for treating the surface of a new casting die involving shot peening, followed by nitriding treatment, followed by a second shot peening (see paragraph [0015]). However, in relation to treatment of a used casting die, JP '845 discloses a method including only a single shot peening step

followed by a nitriding step (see paragraph [0015]) once the residual stress of the casting die surface has fallen below a predetermined value, e.g., 50% of the initial value, (see paragraphs [0016] – [0021]). Moreover, claim 10 depends from claim 6, and incorporates the new limitations thereof. Therefore, for all of the above reasons, applicant respectfully requests reconsideration and withdrawal of the rejection of record, and allowance of pending claim 10.

Claim Rejections – 35 USC § 103

In Item 4, the Office Action rejects claims 14, 16 and 20 under 35 USC 103(a) as unpatentable over JP 2002-060845 (JP '845) in view of JP 10-204,610 (JP '610) and further in view of US 6,546,968 Nakagawa et al. (hereinafter referred to as Nakagawa).

Applicant's Response

Applicant notes that Nakagawa discloses a bond magnet and a method of manufacturing same, e.g., molding a mixture of magnetic powder and resin-based binder under controlled conditions to achieve a desired density …, such that this reference is non-analogous art to the claimed casting die because the reference does not pertain to the field of the present invention (surface treatment of a casting die). While Patent Office classification of references and the cross-references in the official search notes of the class definitions are some evidence of "nonanalogy" or "analogy" respectively, the court has found "the similarities and differences in structure and function of the inventions to carry far greater weight." *In re Ellis*, 476 F.2d 1370, 1372, 177 USPQ 526, 527 (CCPA 1973). It is respectfully submitted that the difference in the function and structure of Nakagawa from the JP 845 and JP 610 references is evidence of non-analogous art. Additionally, the Nakagawa reference does not pertain to the problem addressed by the present invention (the limited service lives of conventional casting dies), such that the Examiner's proposed further modification based on Nakagawa is improper. Moreover, claims 14 and 16 each depend from claim

6, and incorporate the new limitations thereof. Therefore, for all of the above reasons, applicant respectfully requests reconsideration and withdrawal of the rejections of record, and allowance of the pending claims 14, 16 and 20.

In Item 5 of the Office Action, the Examiner responded to the applicant's arguments in previous Amendment-E. The Examiner states that the arguments have been considered but were not persuasive. Applicant respectfully enters the following responses to the Examiner's rebuttal arguments.

A. Applicant respectfully disagrees with the Examiner's assertion that the alleged similar shot peening treatments of JP '845 and the claimed invention will result in same surface roughness (maximum height) of not more than 8 μm, for the same reasons state above in response to the Examiner's rejection of claims 1-3, 6-10, 17-19 and 21-22 (especially in light of the new amendment to claim 6). Further, newly amended claim 6 states that the shot peening treatment last for 5-10 seconds, while the shot peening treatment disclosed in JP '845 extends for a period of 60 seconds. As such, the allegedly similar shot peening treatments are no longer similar since there is a large difference in shot peening duration of at least 50 seconds (i.e. which is 5 times larger than the longest claimed shot peening duration). As such, the claimed invention is distinguishable, and the assumption that the shot peening treatment of JP '845 will result in the surface roughness (maximum height) of not more than 8 μm is improper. Therefore, applicant respectfully requests reconsideration and withdrawal of all of the rejections of record, and allowance of each of the pending claims.

In addition, MPEP 2144.05(B) clearly requires the prior art to recognize as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation.

Since neither JP 845 nor JP 610 recognize the surface roughness as a result-effective variable, the rejection is based on the improper routine experimentation of the variable.

B. It is respectfully submitted that the variable claimed is again outside the range taught by the reference and thus unobvious absent a showing that it would be a matter of routine experimentation to change the desired range (MPEP2144.05)

C. It is respectfully submitted that Jp 845 does relate that the used die has a residual stress, under 1000 MPa, it is again not within the claimed range for the desired stress.

D. It is respectfully submitted that the reference to Nakagawa is non-analogous art as previously argued above.

Based of the foregoing, Applicant respectfully submits that the claimed invention includes features which are neither disclosed nor suggested in any of the applied references JP'845, JP'610 and Nakagawa et al., considered either singly or in combination. Further, the claimed invention including these features obtains an excellent effect that cannot be expected from JP'845 and/or JP'610, i.e., significantly prolonged service life of the casting die. Therefore, the present invention is not obvious over the disclosures of JP'610, JP'845 and Nakagawa et al., considered either singly or in combination.

For all of the foregoing reasons, applicant requests reconsideration and withdrawal of the rejection of claims 6, 10, 14 and 16-22 under 35 USC §103(a).

Conclusion

Based on all of the foregoing, applicant respectfully submits that all of the rejections set forth in the Office Action are overcome, and that all of the pending claims are believed to be allowable over all of the references of record, whether considered singly or in any reasonable combination. It is applicant's contention that no possible reading of the references, either singly or

in any reasonable combination, can be viewed as teaching applicant's claimed invention. For all of the above mentioned reasons, applicant requests reconsideration and withdrawal of the rejection of record, and allowance of each of the pending claims.

The application is now believed to be in condition for allowance, and a notice to this effect is earnestly solicited. If any issues remain unresolved, or if the Examiner feels that the prosecution of the present application could be expedited by a telephone discussion, applicant encourages the Examiner to telephonically contact applicant's undersigned representative to resolve any such issues remaining in the prosecution of the application.

Favorable consideration is respectfully requested.

Respectfully submitted,

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